

Historical Cultural Landscape Conservation- Rejuvenating Surang-Bhawi System of Bidar



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Indian urban centres are engines of growth pushing the economy forward. Urbanisation and economic progress are coterminous processes. This is evident from the fact that, India's urban sector contributes around 62%-63% of GDP, which is likely to increase to 75 % by 2021 as per estimates of Ministry of Urban Development, Government of India. The cities becoming economic centres of growth have resulted in their rapid spatial expansion, mostly unplanned organic growth. As a consequence of increasing economic and social prosperity, natural systems have been substantially exploited, depleted and destroyed. So is the case with historic cultural resources be it tangible or intangible one along Naubad Cultural Landscape at Bidar in North Eastern Karnataka.

An important factor about Indian towns and cities is the long lineage of their cultural heritage. Most Indian towns and cities have a historical core covering 25% to 30 % of its total area. In certain cases like Bidar the historic cultural landscape having its association with natural systems covers neighbourhood villages as well. Thus an integrated approach to conserve cultural heritage and natural systems is important. Cities are here to stay, their expansion cannot be curtailed, and as demand for better infrastructure increases, space constraints will lead to acquisition of quality agricultural land in the city periphery.

The city planners, architects, engineers, urban designers or builders are in constant hunt for sites to develop affordable housing, transportation networks, waste disposal, underground drainage system, green infrastructure and 24x7drinking water system. All these have not only a specific design, space, engineering and economic requirement, but also need to meet certain biophysical constraints that must be taken into account. However, these urban expansion and infrastructure development activities tend to damage the cultural heritage

and biophysical characteristics of land irreversibly.

The damage to the functions performed by natural systems and their fragility in the face of development is primarily due to poor planning, implementation, monitoring and management. The present planning process does not assess the land and cultural resources for their suitability for different development activities. Land and cultural resources assessment provides a scientific basis for identification and selection of most appropriate, efficient use for a particular geographical space. The Master Plan preparation for spatial expansion and new infrastructure creation in town/city needs to be looked from the perspective of incorporating assessment tools for land and cultural resources.

This is where our historic cities score a point higher than the new cities of the present. Of course the population was smaller but the plan of the city and its services was sustainable. Bidar was considered a strategic location, from two perspectives, one being on high ground it was secure from any enemy incursions and two, the availability of good sweet potable water.

These two primary reasons, over and above the connectivity it had within and outside the region, were responsible for the development of Bidar. These reasons lead to the shifting of the Bahmani capital from Gulbarga to Bidar.

Bidar Town and the neighbourhood have been planned with water as the central theme. This is being altered to suit short-term needs of the society and is promoting unplanned organic growth. One of the major reasons is the existing gaps in protection mechanisms and manipulation of these gaps to suit short term needs without ascertaining the impact in the long run, leave alone the other urban problems like solid and liquid waste management, water supply and mobility and their impact.

The existing protection to the cultural and natural systems under

certain policies, acts and laws of local, state and central government, along with conservation plans need to be integrated with urban expansion, planning or the Master Plan. The Karez system in Bidar stands testimony to the way urban expansion, related organic growth and lack of awareness can destroy one of the most sustainable ways of groundwater extraction and use.

What is Karez?

Scientifically, Karez is a sub-surface aqueduct or tunnel that cuts the water table and has many vertical shafts or Air Vents connecting to the surface. In Bidar the Karez system is locally known as "Surang-Bawi System" meaning a tunnel connecting many wells. It normally runs from a higher elevation to a place with lesser elevation. The first shaft that is sunk in higher elevation at source point of water is called 'Mother Well'. The underground tunnel or aqueduct can run several kilometres to open at lower elevation. The opening of the Karez is called 'Karez Mouth'. The tunnel section is referred to as 'Karez Gallery'. A General cross-section of Karez given in figure 1, illustrates its various sections. The Karez gallery cuts the water table and allows groundwater to get accumulated and carried down slope. Though there is distribution mechanism developed at Karez mouth, the air vents are also used as open wells for extraction of water.

Karez systems of Bidar

Bidar is a historic city having a history of more than 700 years. It has been declared as one of the heritage cities of Karnataka State. Very recently, Bidar has been listed under World Heritage Watch List by World Monument Fund. The Historical or cultural landscape in Bidar is very closely associated with the natural resources of the region. The Karez systems are one of the best examples for this. The Karez systems were the lifeline of Bidar's historical period providing water for various purposes within and outside the fort enclosures. The Karez systems in Bidar

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The Karez systems are unique and showcase the ingenious methodology and technique in identifying the water rich areas, harnessing it and transporting to water scarcity areas. The building of a Karez system was laborious and a risky job with no aid of modern technology, maintaining the direction of tunnel digging, endangering oneself with pockets of harmful gases in the earth's cavities and possible collapse of weathered material

are still functional, being used for irrigation and potable water.

Bidar has three Karez systems. In geophysical terms all three are functional, but used partially due to poor or no maintenance, lack of knowledge, blockages due to collapse in gallery and inappropriate interventions. The City of Bidar has been planned with these veins of water stretching from one corner to another, providing sweet potable water to its citizens.

Any new project like developing a new settlement depends on the availability of water. Before, a new settlement is developed, water service network like Karez is built. Naubad Karez System stands testimony to this, unlike our present day processes.

Naubad Karez system

Naubad Karez System was rediscovered during August 2012 and interpreted as a Karez system by the author, which till then people believed was a sort of escape route. The geophysical studies are being carried out by the author as part of his PhD research work.

It is believed that during the Bahmani period there was a scheme for developing a village at Naubad as mentioned by Gulam Yazdani, in his book "Bidar-Its History and

Monuments". As their normal practice, they wanted to ensure that Naubad had adequate water supply before initiating the development of the settlement. The ruling class may have employed Persian engineers or local water diviners for exploring water sources. The Bidar lateritic plateau overlying basaltic Deccan trap provides conditions for developing the Karez System.

Persian engineers may have considered exploiting the ground water by digging a series of wells and interconnecting them with subterranean tunnel, called Karez. The construction of Karez was laboriously done on the laterite plateau. The hard laterite provided ideal conditions for cutting through vertically and horizontally. The main purpose of air vents was removal of debris, air circulation in gallery and easy access for maintenance.

The air vents on the Naubad Karez are approximately at every 50 meters. These air vents or vertical shafts are 15 to 19 metres deep from the surface of laterite plateau. Earlier recordings made by Gulam Yazdani indicate the existence of 21 vertical shafts. But, this is not true. Research and exploration reveals that there are more air vents including the branch gallery, identified during the geophysical survey. Naubad Karez has 55 Air Vents, including its branches; this is being authenticated through restoration process initiated by district administration. Some of the vertical shafts are provided with parapet and masonry lining to reduce run-off damage to vents. Lack of maintenance, thick vegetation growth, and run-off erosion has led to collapse of these parapets.

The gallery is more than 2.56 km in length including the branch. This is the aerial distance though the length of the subterranean gallery is longer, as it zigzags through the local geology. The gallery floor is very gently sloping towards the mouth of Karez. Gallery is wide with average width of one meter. In certain areas, due to collapse of roof and side walls, the gallery has widened. The wide gallery also is testimony of healthy water flow. Average height of

gallery is 6ft. (original) and increases to 10 to 12 ft. in certain areas where roof collapse has occurred. The width does decrease as we move towards the mother well side mainly due to softer geology. At frequent intervals, as one enters each vent through the gallery, Bahamani pointed arch has been carved into the laterite as signature of the times.

Groundwater recharging structure

The runoff from the surrounding area was collected for ground water recharging. An embankment with a reservoir area of 1.34 sq km (approx.) was built by engineers to ensure 24x7 functioning of the Karez system. The embankment is constructed fully using traditional technology and locally available construction material. One of the branches of Karez system starts at the embankment or probably under the reservoir area making it Qanat-e-Saddi. Qanat-e-Saddi refers to those Karez systems which are fed by reservoir as well. This ensured continuous recharging of Karez gallery and kept it perennial. Several wells were also dug at strategic locations to monitor the groundwater. Some of these wells though indilapidated condition, have survived to this age. Of these wells, a few are step wells.

Most of the step wells in Bidar are of historic times, they served multiple purposes. They were initially dug for extracting laterite stone blocks, common construction material in these parts. These laterite quarries were dug below water table and thus served as major water points for city dwellers. They are also important from the perspective of recharging groundwater and maintaining high water table.

There are several examples of rainwater harvesting within the public and royal enclosures of Bidar Fort. The most prominent being the Mahmud Gawan Madrasa and Tarkash Mahal. The water from Mahmud Gawan Madrasa recharges the Jamna Mori Karez system and the water from Tarkash Mahal area was probably used for fountains and gardens.

Rejuvenating the Naubad Karez

Based on the research done by author and inputs provided by him, the Bidar District Administration initiated the revival project on 22nd May 2015. Water diviner and Surangam practitioner from Kasaragod, Kerala, Shri. Kunjambu initiated the cleaning process of Karez system. Kunjambu trained the local labour in cleaning the Karez gallery by maintaining the 1/1000 slope for gentle flow of water. This being important and any change in slope would have led to erosion and gully formations in Karez gallery. The cleaning process is being carried out manually like in the bygone era when it was constructed. A few things that have changed are the use of electricity inside the gallery for lighting and cranes being used to pull out the debris.

On September 15, 2015 a miracle happened. The Naubad Karez started functioning with a rate of flow of 70 litres per minute. This was the moment of truth for the author who has been vouching to clean up the system for nearly two years since August 2012. Two weeks of heavy rains had resulted in rise in water table above the gallery level. The section that yielded water was from Karez mouth to vent 9, which is one of the highest parts of Bidar, hence water table is much lower than the location of Naubad embankment and mother well. As such this section is not the water yielding section for the Karez but it proves another point that if appropriate methods are adopted over ground the water can be retained in soil for long time. The cleaning of gallery and excavation of closed vents are in progress. As of now, half a kilometre of the gallery is fully accessible from the mouth. It may take another 6 to 8 months for fully clearing the debris.

The cleaning of Karez gallery is not quite enough to ensure sustainability; it needs a landscape level conservation approach. The watersheds, stream line and groundwater recharging zones also need to be protected from the organic unplanned growth of the city. The author is working toward developing a comprehensive conservation plan

not just to protect the Karez system but to ensure its sustainability and availability of good groundwater to the local community.

Role of Karez sustainable development

Culture is the reflection of human thoughts, desires, needs, interaction, adaptation, to an environment. It is the engine of human community. Karez is an environmentally sustainable engineering solution reflecting the ingenuity of people living in dried or water stressed regions of the world.

Bidar became an ideal location from both, the military perspective and liveability due to the geographical characteristics of its location. The availability of water and prospect of developing Karez ensured potable water for people of the city even when under siege. The ingenuity of the Karez technology reflects the constructive adaptation of humans to an environment. The Bidar city planning is influenced by the Karez system and the distribution channels.

Karez is a technology that does not deplete the aquifer unlike the modern day pumping systems or bore wells. Karez gallery collects the natural flow of water from the saturated aquifer and transfers along the gallery, ensuring availability of good potable water to people throughout the year. But, the demand for water and increased cultivation of wet crops and unsustainable means employed in agriculture and water management has led to great depletion of groundwater. The solution for this was well built during the historic period in the form of the Naubad Embankment which ensures that rainwater and runoff collection recharge the ground water.

The filled reservoir behind the embankment will have water till summer months thus ensuring higher groundwater table. The Karez rejuvenation and historical cultural landscape conservation will also pave the way for a renewed methodology to look at urban development process. This new methodology being developed

will help in conserving ecologically sensitive areas, which is a necessity due to changing climatic conditions.

Conclusion

The Karez systems are unique and showcase the ingenious methodology and technique in identifying the water rich areas, harnessing it and transporting to water scarcity areas. The building of a Karez system was laborious and a risky job with no aid of modern technology, maintaining the direction of tunnel digging, endangering oneself with pockets of harmful gases in the earth's cavities and possible collapse of weathered material. Hence it is of utmost importance to conserve such systems to provide learning experience for the present and future generations on how keenly our predecessors took care of natural resources.

Conservation is also important from the perspective of its design value of a traditional system of water resource harvesting, both ground as well as surface water. The Naubad Karez can be revived to provide its immediate neighbourhood with 24x7 water supply and can be showcased as a live water museum for learning about sustainable use of water. Conservation, rehabilitation and restoration is a complicated sequence of activities which cannot be done without having appropriate data about the structure, proper standards and guidelines, protection mechanisms, action plans, etc. The ongoing research is working towards developing this.

Another fact that needs to be highlighted here is that the present methodologies followed for urban expansion need to undergo proper assessment before being adopted for development activities. The assessment has to check both natural and cultural resources which are useful for social and economic development of the community. Taking a cue from the statement of Mao Zedong 'We should make the old serve the new', let us look at the historical places / heritage structures / cultural landscape as resources that can work for enriching local communities. ■